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(54) AN IMPROVED APPARATUS AND METHOD FOR  
 CONVEYING EXPLOSIVE SLURRIES TO BORE HOLES

(71) We, ICI AUSTRALIA LIMITED of  
 1 Nicholson Street, Melbourne, Australia, a  
 Company organised and existing under the  
 laws of the State of Victoria, Commonwealth  
 of Australia, do hereby declare the inven-  
 tion, for which we pray that a patent may  
 be granted to us, and the method by which  
 it is to be performed, to be particularly  
 described in and by the following state-  
 ment:—

It is common practice to supply explosive  
 slurries to boreholes through flexible pipe-  
 lines, often of internal diameter as small as  
 2 or 3 cm. As the pipelines may be 100 m.  
 or more in length, and as the slurries often  
 include cross-linking agents to cause them  
 to gel in order to minimise the effect of  
 water in the borehole, the slurries frequently  
 begin to gel before leaving the pipeline so  
 that a great deal of power is expended in  
 pumping the slurries into the borehole.

It is the principal object of the present  
 invention to provide apparatus for combina-  
 tion with a pipeline for conveying explosive  
 slurries to boreholes whereby the residence  
 time of cross-linked slurries in the pipeline  
 is minimised.

In order to achieve the above stated  
 principal object, the present invention pro-  
 vides apparatus in combination with a flex-  
 ible supply pipeline for conveying explosive  
 slurry to a borehole, the apparatus com-  
 prising a rigid open-ended tubular member  
 of approximately the same diameter as the  
 pipeline and mounted as a collinear exten-  
 sion on the discharge end of the pipeline, a  
 turbine mounted within the said tubular  
 member for rotation by the flow of slurry  
 explosive through the said tubular member,  
 a rotatable stirrer mounted for rotation with  
 the turbine and located within the said  
 tubular member at the end thereof remote  
 from the pipeline, and an inner tube of  
 external diameter small in relation to the  
 internal diameter of the pipeline for the

supply of cross-linking agent for the slurry  
 explosive, the said inner tube extending along  
 and within the pipeline to terminate in an  
 outlet within the said tubular member be-  
 tween the pipeline and the stirrer.

The present invention also provides a  
 method of supplying cross-linked explosive  
 slurries to the interior of narrow boreholes,  
 wherein an explosive slurry without cross-  
 linking agent incorporated therein is pumped  
 through a pipeline having at the discharge  
 end the aforescribed apparatus of the in-  
 vention, and wherein a cross-linking agent  
 is supplied through the inner tube of the  
 said apparatus.

The turbine is preferably a strip of material  
 twisted about its longitudinal axis to re-  
 semble an auger extending internally along  
 the said tubular member over part of the  
 length of the tubular member.

For convenience in manufacture and as-  
 sembly, the tubular member is preferably  
 formed in two parts which are detachably  
 connected together in longitudinal alignment.

The area of the outlet aperture from the  
 inner tube is preferably adjustable.

One practical arrangement of an apparatus  
 according to the present invention will now  
 be described with reference to the accom-  
 panying drawings. In these drawings:

Fig. 1 is a side elevation;

Fig. 2 is a cross-section on the line 2-2 of  
 Fig. 1; and

Fig. 3 is a cross-section on the line 3-3 of  
 Fig. 1.

Referring now to the drawings, the pipe-  
 line comprises a flexible rubber pipe 4 three  
 cm. in external diameter to convey explosive  
 slurry from a point of supply to a bore-  
 hole. Fixed to the end of the pipe in align-  
 ment therewith is a metal tubular member  
 5 four cm. in external diameter and 27 cm.  
 in length. A turbine 6, 25 cm. in length,  
 constituted by a metal strip twisted about  
 its longitudinal axis fits neatly within the

tubular member 5 and terminates in an axial arbor 7 at the end remote from the pipe 4. The arbor 7 extends through a central bearing 8 supported by a spider 9 mounted at the end of the member 5 within a further metal tubular member 10 four cm. in external diameter and 11 cm. in length screwed on to the end of the member 5 in alignment therewith. The arbor 7 is fixed to the central shaft 11 of a stirrer 12, 7 cm. in length, having banks of radial vanes 13 fixed to the shaft at approximately 1 cm. intervals. The stirrer 11 is wholly located within the member 10.

A nylon tube 14 one half cm. in external diameter extends within and along the pipe 4, to terminate in an outlet 15 fixed by a spider 16 within the member 5, at the end of the turbine 6 adjacent to the pipe 4. A needle valve 17 permits adjustment of the area of the outlet aperture.

In use, slurry devoid of cross-linking agent is pumped along the pipe 4 and through the tubular member 5, thereby rotating the turbine 6 and stirrer 12. Cross-linking agent is pumped through the inner tube 14 to pass with the slurry along the turbine 6 and to be mixed with the slurry by the stirrer 12 immediately before emerging from the tubular member 10 into the borehole.

#### WHAT WE CLAIM IS:—

1. Apparatus in combination with a flexible supply pipeline for conveying explosive slurry to a borehole, the apparatus comprising a rigid open-ended tubular member of approximately the same diameter as the pipeline and mounted as a collinear

extension on the discharge end of the pipeline, a turbine mounted within the said tubular member for rotation by the flow of slurry explosive through the said tubular member, a rotatable stirrer mounted for rotation with the turbine and located within the said tubular member at the end thereof remote from the pipeline, and an inner tube of external diameter small in relation to the internal diameter of the pipeline for the supply of cross-linking agent for the slurry explosive, the said inner tube extending along and within the pipeline to terminate in an outlet within the said tubular member between the pipeline and the stirrer.

2. An apparatus according to claim 1, wherein the area of the outlet aperture from the tube is adjustable.

3. A method of supplying cross-linked explosive slurries to the interior of narrow boreholes, wherein an explosive slurry without cross-linking agent incorporated therein is pumped through a pipeline having at the discharge end of an apparatus as claimed in claim 1 or claim 2 and wherein a cross-linking agent is supplied through the inner tube of said apparatus.

4. An apparatus substantially as herein described with reference to and as illustrated by the accompanying drawings.

5. A method of supplying cross-linked explosive slurry to a borehole substantially as herein described with reference to the accompanying drawings.

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